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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,377	03/10/2004	Qinglin Ma	2003P04030US01	4475

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Siemens Corporation  
Intellectual Property Department  
170 Wood Avenue South  
Iselin, NJ 08830

EXAMINER
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LAURITZEN, AMANDA L

ART UNIT	PAPER NUMBER
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3737

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/26/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/797,377

Applicant(s)

MA ET AL.

Examiner

Amanda L. Lauritzen

Art Unit

3737

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>4 Dec 2006</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments filed 4 December 2006 have been fully considered but they are not persuasive and/or moot in view of new grounds of rejection warranted by amendments to the claims.
2. Applicant has traversed rejection of claim 5 under 35 U.S.C. 112, second paragraph with citation of p. 2, lines 1-10 for support in the specification; however, Examiner has pointed out that claim 5 recites "with uniform sensitivity of the vessel", which is not clarified with this excerpt. Examiner agrees that uniform sensitivity is a known technique to measure volume flow, but uniform sensitivity is a feature of the transducer, not of the vessel. Examiner suggests amending to clarify either a) that a uniform sensitivity technique is employed or b) that uniform sonification of the vessel is provided, or a combination of both a) and b) because the claim is unclear as worded.
3. Applicant has amended claim 1 to include the limitations of claim 6 in addition to specifying that "the three rows are straight along an azimuth dimension and having rectangular elements". Fig. 10b of Fu et al. met all limitations of the original claims 1 and 6. Examiner must now rely on the embodiment of Fu depicted in Figs. 8 and 9 to meet all added limitations.
4. Regarding claim 3, Examiner notes that the disclosure of Fu does not specify being steerable in the elevation as Applicant has suggested as reason against 1.5D operation. Furthermore, it is well known to those skilled in the art to use 1.5D arrays to perform two-dimensional imaging and/or measure of a flow parameter, as cited in the original Office action. As evidence for this per Office policy regarding Official Notice, Examiner cites Hossack et al. of

Art Unit: 3737

US 6,360,027 for providing imaging and/or measure of a flow parameter using a 1.5D array (col. 9, lines 38-43 for imaging and flow data and col. 12, lines 45-46 for use of a 1.5D array with the invention).

5. Regarding claims 8 and 18 for kerfs extending partially along a row of elements, the kerfs of Stephens are cuts made into the flex circuit that “isolate array elements from each other” (para. 97, lines 1-3). The transducer elements are attached to the flex circuit, so in making cuts in the flex circuit, kerfs are formed between transducer elements. The disclosure of Stephens recites that elements “may be left connected to each other by making cuts through only the middle portion of the flex circuit” (para. 97, lines 7-9) which meets the criteria of kerfs extending partially along a row of elements.

6. Applicant has amended claim 9 to include the limitation of “at least four rows of elements in a fully sampled NxM grid,” Examiner notes that the embodiment of Fu depicted in Figs. 8 and 9 clearly meets this limitation.

7. Regarding Applicant’s argument that the possibility of configurations disclosed by Robinson do not suggest actual configuration, Examiner points out that since there is no criticality for the named arrangements presented in Applicant’s disclosure, and because the arrangements are satisfied by switching elements with the array of Robinson, the rejection is maintained. Additionally Applicant has pointed out that switching elements of the sparse array of Robinson to include additional elements will not change the size of the elements, but there are no claimed limitations related to element size.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

Art Unit: 3737

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not understood what is meant by the phrase "with uniform sensitivity of the vessel". Perhaps instead applicant means to claim either uniform sensitivity of the *imager* or uniform *insonification* of the vessel. For examination purposes it is construed as uniform sensitivity of the imager to provide uniform insonification of a vessel, particular to the attenuation compensated volume flow (ACVF) method of Hottinger and Meindl as cited in the disclosure.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-3, 5, 9-12, 14, 15, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Fu et al. (U.S. Patent No. 4,431,936).

Fu et al. disclose a method for measuring a volume flow parameter as a function of acoustic energy transmitted from an annular configuration of a plurality of transducer array elements and indicate use of the same array to acquire ultrasonic images. Fu further discloses transmitting a uniform far field acoustic pattern and receiving a wide and a narrow far field acoustic pattern (see col. 5, lines 53-64 where the beams are both generated and received). The volume flow parameter is calculated as a function of a first power associated with a uniform far

Art Unit: 3737

field acoustic pattern and a second power associated with the narrow far field acoustic pattern (col. 3, lines 9-13). Though the processor used to make these calculations is not explicitly disclosed, such computation is known to require a processor to those skilled in the art. Likewise, a display is inherent in the viewing the images that are generated by the invention of Fu.

10. Regarding claims 3 and 12, though the disclosure of Fu is not particular to specify 1.5D operation of the array to perform two-dimensional ultrasound imaging and measure of the flow parameter, it is well known to those skilled in the art to use 1.5D arrays for such purposes.

11. Regarding claim 5, Fu details use of the ACVF method of Hottinger that is cited in applicant's specification to provide uniform insonification of the vessel (see col. 2, lines 54-59), according to how the examiner construes this claim as outlined in section 10 above.

12. Regarding claims 1, 9, 14 and 15, both imaging and volume flow measures are performed with the embodiment of Figs. 8 and 9 that shows at least three rows of elements being straight along an azimuth dimension, including a first group of elements formed into a central element and a second group of elements arranged about the central element and used in the measure of a volume flow parameter. Additionally, Fu discloses the use of at least one of the at least three rows of elements for imaging (see abstract in which the linear array is focused for a sample volume and a segmented element within the linear array defines a scan surface). The two-dimensional image is inherently responsive to at least one of the rows of elements, as some response is necessary for the image generation that Fu discloses as being accomplished with this array. The array of Figs. 8 and 9 shows at least four rows of elements in an NxM grid.

13. Regarding claim 10, array interconnections are inherent for communication between elements for any ultrasound application, but the examiner takes note that Fu '936 also cites array

Art Unit: 3737

element interconnections in an alternate embodiment (see electrical connections in col. 6, lines 43-44).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 2 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. '936 in view of Nudell et al. (U.S. Patent No. 5,085,220). The Fu reference teaches all the features of the invention substantially as claimed, including the method of flow calculation based upon the power associated with two beams, but is not particular to disclose a first velocity measure in the calculation of the volume flow parameter. However, in the same field of endeavor, Nudell discloses the method for calculation of a volume flow parameter (i.e. cardiac output) that also includes transmission of two Doppler paths to obtain a first velocity and power associated with the first (i.e. wide beam) Doppler path and a second power associated with the second (i.e. narrow beam) Doppler path (col. 2, lines 37-44).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to have incorporated the volume flow parameter method of calculation as taught by Nudell '220 with the imaging system and volume flow measure method of Fu '936 in order to provide improved accuracy in measure of a volume flow parameter.

Art Unit: 3737

15. Claims 4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. '936 in view of Robinson et al. (U.S. Patent No. 6,419,633). Fu '936 discloses the invention substantially as claimed but is not particular to disclose image generation by of one of a B-mode or a Doppler mode. However, in the same field of endeavor, Robinson '633 cites both B-mode and Doppler mode two-dimensional imaging (col. 9, lines 28-29). These means of two-dimensional image generation as taught by Robinson were known at the time of the applicant's invention and would have been obvious to use in the system of Fu in order to provide the physician with the image view that is best suited for patient diagnosis.

16. Claims 7 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. '936 in view of Ma (U.S. Patent No. 6,599,245). Fu '936 teaches all the features of the invention substantially as claimed, including providing different transmit waveform polarity (see field direction parameter in col. 4, lines 63-64), but is not specific to providing different apodization to different groups of elements simultaneously or focusing as a function of apodization delay. However, in the same field of endeavor, Ma '245 discloses a transmit apodization system that is capable of providing different apodization for each transducer element as they are determined separately according to the apodization function (col. 1, lines 41-43).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to incorporate the apodization function of Ma '245 with the imaging and volume flow measuring system of Fu '936 in order to provide control of the acoustic power delivered for different groups of array elements for improved image quality (see col. 1, lines 21-25 of Ma '245).



Art Unit: 3737

17. Claims 8 and 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. '936 in view of Stephens (U.S. Application Publication No. 2004/0054287) and Robinson et al. '633.

The Fu '936 reference discloses all the features of the invention substantially as claimed, including a kerf structure separating the rows of transducer elements (see insulation between the transducer elements cited in claim 2 of Fu '936), but is silent regarding the detail of the kerf structure extending along the azimuth dimension a distance less than that of the first row of elements. However, in the same field of endeavor, Stephens '287 discloses that kerf structures isolate array elements from one another and further points out that cuts may extend the length of the row to fully isolate each row of elements or be left connected to each other by making cuts through only the middle portions of the row (para. 0097, lines 6-9). Hence, the kerf structures of Stephens are disclosed to extend along the azimuth dimension less than the first row or azimuth length and it therefore would have been obvious to one of ordinary skill in the art at the time of applicant's invention to have incorporated this feature with the system of Fu '936 for the purpose of acoustic decoupling of selected adjacent array elements (see Stephens '287 abstract, lines 10-13).

18. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al. '936 in view of Stephens '287 and Robinson et al. '633.

The invention of Fu '936 as modified by Stephens '287 teaches all the features of the instant invention but does not account for the multiplicity of rows in applicant's claims 19 and 20. However, Robinson '633 teaches a 19-row (azimuth direction), 19-column (elevation direction) "sparse" array in which there are inactive spaces between the active transducer

Art Unit: 3737

elements (col. 3, lines 10-12). Further detailed are switches and coax cables that establish a connection to activate elements (col. 4, lines 48-50); therefore, any configuration of rows and/or elements can be established with this array, as long as it is within the 19-row, 19-column dimensions, so additional elements that extend from each azimuth side can be configured to have an elevation width that is substantially equal to the elevation width of the first row, second row, and kerf together, as in applicant's claim 19, or the width of the additional elements could be configured as greater than the width of the elements of each of the first through fifth rows, as in claim 20. As it has been shown, the structural configurations of transducer arrays cited in claims 19 and 20 are possible with the sparse transducer array of Robinson '633, and therefore these configurations and others accommodated by the sparse transducer array would have been known to those of ordinary skill in the art at the time of the applicant's invention and therefore obvious to be used in the transducer array associated with the invention of Fu '936 as modified by Stephens '287 for the purpose of providing improved image quality by increasing the number of array elements and/or rows.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

Art Unit: 3737


the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda L. Lauritzen whose telephone number is (571) 272-4303. The examiner can normally be reached on Monday - Friday, 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian L. Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
A. Lauritzen  
2/6/2007

  
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